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Kamran, Muhammad; Malik, Qaisar Ali

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Do financial variables affect the systematic risk in sugar industry?

Muhammad Kamran*
Army Public College of Management Sciences
Rawalpindi, Pakistan.
kamiMalix88@hotmail.com

Qaisar Malik
Associate Professor
Department of Economics & Finance
Faculty of Business & Technology
Foundation University
Rawalpindi, Pakistan.
qamalik@gmail.com

Abstract: The purpose of this study is to investigate the relationship between financial variables and systematic risk. The studied variables are explored as determinants of systematic risk. This study analyzed the annual data over the period of 2005-2015 from selective industry. To test the studied hypotheses simultaneously, panel tests were applied along with multiple regression analysis approach. The findings of sugar industry have shown that liquidity, leverage (insignificant), operating efficiency, dividend payout, and chin model are inversely associated while profitability and Tobin q (insignificant) are positively related with Systematic risk. The regression results show that significant association of liquidity, profitability, operating efficiency, growth, dividend payout and chin model are with earlier studies. The studied variables have decisive impact for determinants of Systematic risk. Findings are fruitful for all stakeholders to maximize the returns by reducing the risk factors.

Key words: Systematic Risk, Financial Variables, Sugar Industry, Pakistan Stock Exchange.

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1. Introduction

The most recent global financial crisis has clearly evidenced the need for all stakeholders to develop a comprehensive understanding of systematic risk. It influences a large number of assets and hit the entire market. Systematic risk results from political factors, economic crashes and recessions, changes in taxation, natural disasters and foreign investment policy, wars and variation in interest rate policy etc. which affects the entire market and are unavoidable through diversification (Nucera et al. 2016; Gupta & Gurjar, 2014; Iqbal & Shah, 2012). Such sort of risk is unpredictable and unfeasible to completely avoid. Identification of Systematic risk and impact of financial variables (FV's) are the major part of this study. The study examines specific indicators in selective area i.e. sugar industry of Pakistan economy.

Systematic risk is revealed as market risk and it is an un-diversifiable risk. It does bring the volatility/ambiguity situation in the market and bring instability in day to day business activities and stock prices. Louge and Merville (1972) recommended that financial ratios predict

Systematic risk by various industries. Iqbal and Shah (2012) determined the Systematic risk of Karachi Stock Exchange (KSE 100 index) by using eight financial variables and defined the important features of Systematic risk and impact of financial variables on it.

Sugar Industry is considered as the second largest agro based industry after textile industry in Pakistan. Being an agricultural country, Pakistan has a major contribution in cane production and is ranked fifth in world and 9th in sugar production. The sugar industry contributes 0.7% in GDP and in context of value addition of agriculture as 3.2%. Sugar industry is highly significant with full market capacity of 5,614,957 metric tonnes and an annual consumption of around 4.6 mln tonnes. Consumption continuous to grow due to rising demand from an expanding population and the emerging processed food sector. To enhance the production process, the government needs to support agricultural research & development (R&D) program, training of farmers and create awareness of new technologies & methods. To support government, agricultural universities in Pakistan have taken initiatives in this regard and few sugar mills also support (R&D) activities/programs. In future it will have a long lasting impact on the sugar industry. The present research is directed towards finding the possible answer for the following research question: does the FV's affect the Systematic risk in sugar industry of the Pakistan economy?.

This study assists all stakeholders in understanding and tackling Systematic risk faced by the sugar industry in Pakistan. It develops the comprehensive understanding of factors and their relationship with Systematic risk. Apart from providing useful information to investors, it also provides recommendations to firm owners to mitigate the effects of Systematic risk. It also provides the base for other researcher/analysts to comprehensively analyze this issue and modify the characters.

2. Literature Review

Previous research has focused on the diversification of the risk factor, which affect the individual firms and market performance. Two types of risks exist in the market - Systematic and un-Systematic risk. It is necessary to understand the nature and occurrence of risk and associated tools and techniques (Allen et al, 2010). Systematic risk is directly associated with market while un-Systematic risk is linked with an individual company. The term beta is symbolized for Systematic risk, it means that variation in stock due to change in market or in generalized form it is covariance of stock returns of capital market (Gu & Kim, 2002). The Systematic risk cannot be eradicated from any security by applying diversification technique but un-Systematic risk can be removed or reduced with the help of diversification techniques.

Choo et al. (2016) in their study analyzed the nature of risk factors. The authors are of the view that when diversification is weak, it will lead to higher systematic risk and vice versa. Allen, et al. (2009) point out that failure of one financial institution leads to the default of other financial institutions through a networking/chain effect, e.g. central bank is the best example of such type of risk. Allen and colleagues have correlated financial influences and funding maturity in causing Systematic risk.

In modern era, the biggest problem faced by risk management is to address the aggregate risk of capital, thus, by employing economic utility theory one can find out the nature of risk (Furman & Zitikis, 2018). Hinz and Trilling (2015) in their study focused on the effect of hackers on share prices of companies. They found that hacker attacks on consumer electronics companies resulted in decrease in the share prices of the companies. They further point out that the market players do not give necessary attention to this problem that is required. Morelli (2014) in his study examined the profit behavior and systematic risk of England stock market over period of 1998 to

2010. Tasca, et al. (2000) pointed out that the unnecessary debt financing on the part of financial institutions is considered one of the primary factors in the default of financial institutions since it magnifies investment losses; whereas, portfolio diversification acts as a reason to decrease the effects. Laeven, et al. (2015) have highlighted that Systematic risk grows with the size of bank and it is inversely related to bank capital. Systematic risk is not only affecting the banking sector, but has also affected credit intermediation outside the banking system.

Nucera et al., (2016) proposed Systematic risk in ranking order for financial institutions using the method of principal components. For analyzing, they used a sample of 113 listed financial firms in the European Union over 2012-13. The findings revealed that the combined ranking is more constant at the top and is less volatile then individual input rankings.

The main objective of investors, shareholder and stakeholder is to diversify the risk, which affect the individual firms and market performance. Rowe and Kim (2010) described the association between Systematic risk and financial variables by using casino industry data, results showed that significant relationship between betas and financial variables exists. Iqbal and shah (2012) using the eight financial variables explored the Systematic risk of non-financial firms in Karachi Stock Index. And found that most of the variables were significant in relation to systematic risk. Gupta and Gurjar (2014) explored the betas and average returns for providing a helpful role for an investor in decision making process. Darmayanti (2015) found a significant effect on stock price of food and beverage firms listed on Indonesian stock exchange. The study used multiple regression analysis and showed a simultaneous effect of return on equity, earning per share and Systematic risk on stock price. T test result showed partially significant effects on stock price.

Mohammadi et al., (2015) found significant relationship between portfolio of 21 selective companies of Tehran stock market and Systematic risk as well as financial leverage. A study on companies listed on Nairobi securities exchange found that leverage had negative relationship on financial performance and liquidity was more essential determinant in improving the firm's financial performance. Waemustafa and Sukri (2016) pointed out that it is necessary for banks to maintain higher level of liquidity to averse the risk factors. Their study has shown that Islamic banks maintain higher liquidity as compared to conventional banks. McKibben (1972) specially discussed the companies' bankruptcy conditions and found that CHIN model was an important tool in the model/index of bankruptcy and significantly effective. Previous studies are helpful for determination of systematic risk of financial and non-financial industry context. Significant correlations between beta and financial variables exist in the literature that highlights significant outcomes of leverage, profitability and firm size in the determents of beta. Kim and Gu (2002) have also suggested that association of Systematic risk should be related to change in financial and operating management practices. Thus, based on the previous literature, following research hypotheses have been formulated:

H1: Liquidity has a negative relationship with Systematic risk.
H2: Leverage has a positive relationship with Systematic risk.
H3: Profitability has a positive relationship with Systematic risk.
H4: Operating efficiency has a negative relationship with Systematic risk.
H5: Growth has a negative relationship with Systematic risk.
H6: Dividend payout has a negative relationship with Systematic risk.
H7: Tobin Q has a negative relationship with Systematic risk.
H8: CHIN model has a negative relationship with Systematic risk

3. Research Methodology

In this study, secondary data through convenient sampling for more accurate results was used. 15 companies from sugar industry from (2005 -2015) were selected. For a briefed analysis, both cross-sectional and time series data have been used. The selected 15 companies were prominent and were of repute in the market and also the data were easily available for the selected companies. There are eight FV's used in the regression analysis. Systematic Risk is treated as a dependent variable while Liquidity, Leverage, Profitability, Operating Efficiency, Growth, Dividend Payout, Tobin Q, Chin model were taken as independent variables. The panel data was taken from annual reports/balance sheet of the selected companies, company websites, Pakistan Stock Exchange (PSX) and Yahoo finance.

Data of FV's are collected using different financial ratios from annual reports of companies. Dependent variable Systematic risk (Beta) data was annually collected from PSX and Yahoo finance website. In order to test the hypotheses simultaneously, multiple regression is used. Panel tests (Fixed and Random Effect tests) have been applied to observe the impact of FV's on Systematic risk.

4. Results

Panel data is used in this study. It provides information both on cross-sectional and time series dimensions. The regression equation developed in this study takes the following form:

$$\mathbf{Y = \beta_0 + \beta_1 LIQ + \beta_2 LEV + \beta_4 \pi + \beta_5 EFY + \beta_6 g + \beta_7 D + \beta_8 TQ + \beta_9 CHIN + \mu}$$

Y = Systematic Risk (Beta)
β_0 is the Constant or intercept
β's = Slope or Coefficient of independent variables
LIQ = Liquidity
Lev = Leverage
π = Profitability
EFY = Operating Efficiency
g = Growth
DP = Dividend payout
TQ = Tobin Q
CHIN = CHIN Model
μ = Standard Error Term of Coefficient

4.1. Correlation Analysis

To investigate the multicollinearity problem Pearson correlation was applied to examine the relationship and strength of the association among all quantitative variables. Table 1 shows the correlation among all variables and it's highlighted that there is no problem of multicollinearity. The coefficient values of explanatory variables are less than benchmark figure. Liquidity, Profitability, Operating Efficiency, growth and chin model are negatively correlated with Systematic risk (Beta) and leverage, dividend payout and Tobin q have a positive correlation with dependent variable. The maximum correlation lies between Growth and liquidity (0.5) that will not disturb the findings of research.

Table 1: Correlation Matrix

Correlation Matrix

	Beta	Liq	Lev	Profity	Op Eff	Growth	DP	TQ	CM
Beta	**1.000**								
Liq	-0.013	**1.000**							
Lev	0.007	-0.053	**1.000**						
Profity	-0.099	0.035	0.248	**1.000**					
OP Eff	-0.056	0.314	0.032	-0.061	**1.000**				
Growth	-0.075	0.582	-0.091	-0.009	0.327	**1.000**			
DP	0.274	0.059	-0.046	-0.013	0.102	0.046	**1.000**		
TQ	0.024	-0.058	-0.135	-0.132	-0.043	0.068	-0.017	**1.000**	
CM	-0.070	-0.075	0.019	-0.017	-0.000	-0.031	0.062	-0.174	**1.000**

4.2. Descriptive Statistics

To check the normality of data descriptive statistic (Table 2) was used.

Table 2: Descriptive Statistics

Descriptive Statistics

Description	Beta	Liq	Lev	Profity	Op. Eff	Growth	DP	TQ	CM
Mean	1.76	0.41	0.68	0.06	0.32	20.1	1.11	1.98	0.59
Median	1.44	0.10	0.60	0.03	0.09	5.62	0.00	2.06	0.53
Max	7.77	7.85	1.76	1.40	3.86	110.8	53.4	5.90	6.29
Min	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00
StdDev	1.41	0.96	0.38	0.13	0.62	87.9	4.46	1.18	0.57
Skewness	1.72	4.58	0.62	7.72	3.34	11.63	10.08	0.28	5.85
Kurtosis	7.28	28.52	2.89	71.7	14.9	14.4	11.63	2.79	59.2
Obs	165	165	165	165	165	165	165	165	165

The mean values of all the variables such as liquidity, leverage, profitability, operating efficiency, growth, dividend payout, tobin q, chin model are positive mean value as indicated in Table 2. The mean value of beta is 1.76 that is greater than market beta. It indicates that the stock of selected industries is risky and less volatility than the market. Similarly, the mean value of liquidity is 0.41 and standard deviation of 0.96 and leverage is 0.68 and standard deviation is 0.38. Subsequently the mean value of profitability, operating efficiency, growth, dividend payout, Tobin q and chin model are positive respectively.

4.3. Regression Results

Regression finding shows (Table 3) the relationship between FV's and Systematic risk. The numeric figure provide strong evidence ($0.05 < P > 0.01$) that the six FV's (Liquidity, profitability, Operating Efficiency, Growth, Dividend Payout, Chin Model) have significant relationship at the level of 5% and rest of the variables (Leverage and Tobin Q) are insignificant. The outcomes of research provide the evidence that the value of R-square and adjusted R-square is 12% and 7% respectively that is low and it indicates that the other variables may also be included for determining the Systematic risk. The f-statistic has shown that the model is

significant at 1%, 5% and 10% level. The durbin-waston is also normal indicating that there is less effect of autocorrelation.

Table 3: Regression Results for Sugar Industry

Variables	OLS			Fixed Effect Model			Random Effect Model		
	Coefficient	S.E	t-stat	Coefficient	S.E	t-stat	Coefficient	S.E	t-stat
Intercept	-1.7149	0.3208	5.3451	1.8902	0.4036	4.6824	1.7915	0.3594	4.9839
Liquidity	0.0503	0.0208	2.4140	0.0541	0.0328	1.6461	0.0503	0.0247	2.0346
Leverage	0.2079	0.1870	1.1113	-0.3638	0.2500	-1.4553	-0.0352	0.2244	-0.1572
Profitability	-1.2166	0.6193	-1.9643	-1.1900	0.4976	-2.3912	-1.1964	0.6073	-1.9700
Operating Efficiency	-0.2145	0.0982	-2.1839	-0.2848	0.1503	-1.8941	-0.2226	0.1026	-2.1689
Growth	-0.0003	0.0001	-2.4233	-0.0004	0.0001	-2.2491	-0.0003	0.0001	-2.3402
Dividend Payout	0.0919	0.0137	6.6724	0.0859	0.0146	5.8667	0.0879	0.0134	6.5449
Tobin Q	0.0576	0.1449	0.3975	0.1819	0.1458	1.2474	0.1100	0.1552	0.7085
CHIN Model	-0.2337	0.0944	-2.4759	-0.2314	0.1004	-2.3035	-0.2421	0.0898	-2.6951
R Square		**0.12**			**0.31**			**0.12**	
Adj R Sq		**0.07**			**0.21**			**0.08**	
D-W		**1.27**			**1.66**			**1.44**	
F-Statistic		**0.00**			**0.00**			**0.00**	
Observations		**165**			**165**			**165**	

Next, panel test was applied on the model. The fixed effect test findings shows that there are four into variables (Liquidity, leverage, operating efficiency, Tobin q) which are significant at 5% level and four variables have (Profitability, growth, dividend payout, chin model) Insignificant outcomes. The durbin waston value (1.66) was also found to be in acceptable region. The findings of random effect model reveal that most of the FV's (Liquidity, profitability, operating efficiency, growth, dividend payout, chin model) are significant, whereas, Leverage and tobin q are found insignificant. The durbin waston value is 1.44 shown that there is autocorrelation problem in model. Accordingly, the values of R and Adjusted R Square (0.14, 0.09) respectively show that dependent variable has a less variation due to independent variables. F-statistic value confirms the fitness of the model. The outcomes of FV's against research hypotheses are presented in matrix (Table 4).

Table 4: Hypotheses Matrix

Hypothesis	OLS	Fixed	Random	Description
	0.05 < P > 0.01			
Liquidity is inverse relationship with Systematic risk.	√	**X**	√	According hypothesis that through the OLS and Random effect found significant relationship with dependent variables. Liquidity is really help full in term of converting the asset into liquid form and reduce the risk factor. Hence the fixed effect found insignificant outcome.
Leverage is positively relationship with Systematic risk.	**X**	**X**	**X**	Debt is very useful tool to boost up industry. In case of sugar industry we found insignificant results. Its mean there is no relationship with dependent variable.
Profitability is positive relationship with Systematic risk.	√	√	√	The priority of any kind of the business is to reduce the cost/expenses and increase the level of income. The difference of expenses and revenue is called profitability of business. It's an easy way to judge the company performance in competitive market. Here we found FV's have a statistical significant relationship with dependent variable.
Operating efficiency is inverse relationship with Systematic risk.	√	**X**	√	The industry closely relay on operational activities of business like to utilize the all recourses in efficiently manner. Findings reveal that if company well performed in operating activities it will decrease the chance of Systematic risk. while applying the fixed effect model we found insignificant relationship rest of the model we found significant at 5%.
Growth is inverse relationship with Systematic risk	√	√	√	The positive growth rectifies the good glimpse of industry. The outcomes show that increasing the level of growth will decrease the Systematic risk. The results reveal that significant ending with dependent variable.
Dividend payout is inverse relationship with Systematic risk.	√	√	√	Sugar industry is good reputation during the dividend payout scheduled. This KPI is significant after analyzing panel tests.
Tobin Q is inverse relationship with Systematic risk	**X**	**X**	**X**	Tobin q defined the market performance of company/industry. Here we found insignificant relationship with Systematic risk. Due to the weak market pattern of this industry.
CHIN model is inverse relationship with Systematic risk	√	√	√	Generically, the variation in income level helpout to understand the direction (upward & Downward) of firm/industry. We found significant relationship with Systematic risk.

The Hausman test (Table 5) is also applied to judge which model (fixed or random) is more effective. In this regard hypothesis was developed as

H0 = random effect is most suitable and consistent for panel regression analysis.

H1 = random effect test will be inconsistent in panel regression analysis.

Table 5: HAUSMAN Test Result (Sugar Industry)

Test Summary	**Chi-Sq Statistic**	**Chi Sq. d.f**	**Prob**
Cross Section random	**0.0000**	**8**	**1.00**

The finding indicates that p-value is greater than 5%, thus, the random effect model is more appropriate for sugar industry.

5. Conclusion

In this research, we found that the risk factor exposure is highly desirable for all stakeholders. The results of this study have implications for all stakeholders. To understand the situation and to tackle the problem which occurs in the market and indirectly affect the company performance, the business decisions are highly correlated with the company performance and good will. Selected FV's in this study drive the significant predictor of Systematic risk. In modern era, the financers/policy makers face the problem of the fluctuation in the stocks and companies performances on daily basis. It also deals with investor point of view who is seeking higher return against their investment. This study helps the stakeholders to understand the nature of risk and how to reduce it. As a result of good performance of companies and financial market will grow in a better way. The results of the study can only be generalized to sugar industry alone. Another limitation of the study is that only few selected financial variables have been used for analyzing the Systematic risk, thus, the results cannot represent the entire economic perspective. It is recommended that different industries or sectors including financial sector should be included to gather meaningful results. Furthermore, future studies can incorporate macroeconomic factors as well.

Bibliographical note: Muhammad Kamran did his M.Sc in Economics from National University of Modern Languages (NUML), Islamabad, Pakistan. He completed his M.S. in Finance from Army Public College of Management Sciences (APCOMS) (*Affiliated University of Engineering, Taxila, Pakistan*). Being a research student his interests focus on financial aspects (Risk Management, Corporate Sector, Forecasting, Stock Market Behavior etc).

Dr. Qaiser Ali Malik is Associate Professor and Head of Department of Department of Economics & Finance at Foundation University, Rawalpindi, Pakistan. His research interests include financial management, economic development and sustainability.

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